R309. Environmental Quality, Drinking Water.
R309-515. Facility Design and Operation: Source Development.
R309-515-6. Ground Water - Wells.

(1) Required Treatment.

If properly developed, water from wells may be suitable for culinary use without treatment. A determination as to whether treatment may be required can only be made after the source has been developed and evaluated.

(2) Standby Power.

Water suppliers, particularly community water suppliers, should assess the capability of their system in the event of a power outage. If gravity fed spring sources are not available, one or more of the system's well sources should be equipped for operation during power outages. In this event:

(a) To ensure continuous service when the primary power has been interrupted, a power supply should be provided through connection to at least two independent public power sources, or portable or in-place auxiliary power available as an alternative; and

(b) When automatic pre-lubrication of pump bearings is necessary, and an auxiliary power supply is provided, the pre-lubrication line should be provided with a valved by-pass around the automatic control, or the automatic control shall be wired to the emergency power source.

(3) The Utah Division of Water Rights.

The Utah Division of Water Rights (State Engineer's Office) regulates the drilling of water wells. Before the drilling of a well commences, the well driller must receive a start card from the State Engineer's Office. For public drinking water supply wells the rules of R655-4 still apply and must be followed in addition to these rules.

(4) Source Protection.

Public drinking water systems are responsible for protecting their sources from contamination. The selection of a well location shall only be made after consideration of the requirements of R309-600. Sources shall be located in an area which will minimize threats from existing or potential sources of pollution.

Generally, sewer lines should not be located within zone one and zone two of a public drinking water system's source protection zones. However, if certain precautions are taken, sewer lines may be permitted within a public drinking water system's source protection zone one and zone two. Sewer lines shall meet the conditions identified in R309-600-13(3), and shall be specially constructed throughout zone one in aquifers classified as protected, and zones one and two, if the aquifer is classified as unprotected, as follows:

(a) sewer lines shall be constructed to remain watertight. The lines shall be deflection tested in accordance with the Division of Water Quality Rule R317-3. The lines shall be video inspected for any defect following completion of construction and before being placed in service. The sewer pipe material shall be:

(i) high density polyethylene (HDPE) pipe with a PE3408 or PE4710 rating from the Plastic Pipe Institute and have a Dimension Ratio (DR) of 17 or [~~lower~~]less, and all joints shall be fusion welded, or

(ii) polyvinyl chloride (PVC) pipe meeting AWWA Specification C900 or C905 and have a DR of 18 or [~~lower~~]less. PVC pipe shall be either restrained gasketed joints or shall be fusion welded. Solvent cement joints shall not be acceptable. The PVC pipe shall be clearly identified when installed, by marking tape or other means as a sanitary sewer line, or

(iii) ductile iron pipe with ceramic epoxy lining, polyethylene encasement, restrained joints, and a minimum pressure class of 200.

(b) procedures for leakage tests shall be specified and comply with Division of Water Quality Rule R317-3 requirements.

(c) lateral to main connection shall be fusion welded, shop fabricated, or saddled with a mechanical clamping watertight device designed for the specific pipe;

(d) [~~the sewer pipe to manhole connections shall be made using a shop fabricated sewer pipe seal ring cast into the manhole base (a mechanical joint shall be installed within 12 inches of the manhole base on each line entering the manhole, regardless of the pipe material)~~]inlet and outlet sewer pipes shall be joined to a manhole with a gasketed flexible watertight connection;

(e) the sewer pipe shall be laid with no greater than 2 percent deflection at any joint;

(f) backfill shall be compacted to not less than 95 percent of maximum laboratory density as determined in accordance with ASTM Standard D-690;

(g) sewer manholes shall meet the following requirements:

(i) the manholes shall be constructed of reinforced concrete;

(ii) manhole base and walls, up to a point at least 12 inches above the top of the upper most sewer pipe entering the manhole, shall be fabricated in a single concrete pour without joints; and

(iii) the manholes shall be air pressure tested after installation.

(h) in unprotected aquifers, an impermeable cutoff wall shall be constructed in all sewer trenches on the up-gradient edge of zone two. In protected aquifers, an impermeable cutoff wall shall be constructed in all sewer trenches on the up-gradient edge of zone one.

(5) Outline of Well Approval Process.

(a) Well drilling shall not commence until both of the following items are submitted and receive a favorable review:

(i) a Preliminary Evaluation Report on source protection issues as required by R309-600-13, and

(ii) engineering plans and specifications governing the well drilling, prepared by a licensed well driller holding a current Utah Well Drillers Permit if previously authorized by the Executive Secretary or prepared, signed and stamped by a licensed professional engineer or professional geologist licensed to practice in Utah.

(b) Grouting Inspection During Well Construction.

(i) Authorized Individuals

(A) The following individuals are authorized to witness the well sealing procedure for a public drinking water well:

(I) An engineer or a geologist from the Division of Drinking Water,

(II) A district engineer of the Department of Environmental Quality,

(III) An authorized representative of the Division of Water Rights, or

(IV) An individual having written authorization from the Executive Secretary and meeting the below listed criteria.

(B) At the time of the well sealing an individual, who is authorized per (i)(A)(IV), shall present to the well driller a copy of the letter authorizing him or her to witness a well sealing on behalf of the Division of Drinking Water. A copy of this letter shall be appended to the witness certification letter.

(C) At least three days before the anticipated well grouting the well driller shall arrange for an authorized witness listed in (i)(A) above to witness the procedure. (See R309-515-6(6)(i)).

(ii) Obtaining Authorization

(A) To be authorized per (i)(A)(IV) above to witness a well sealing procedure, an individual must have no relationship to the driller or the well's owner and have at least five years professional experience designing wells, supervising well drilling or other equivalent experience associated with well drilling or well sealing that are acceptable to the Executive Secretary.

(B) Individuals, desiring the Executive Secretary's authorization to witness a well grouting procedure, shall provide the following information to the Executive Secretary for review over his or her signature attesting to the correctness of the information:

(I) A detailed description of the applicant's experience with well drilling projects, including number of years of experience and type of work. Three references confirming this professional experience are required.

(II) Evidence of licensure as a professional engineer or professional geologist in Utah.

(III) No relationship may exist between a person authorized to witness well sealings and a well driller that would serve as the basis for suspicion of favoritism, leniency or punitive action in the performance of this task. Examples of such relationships would be: family; former long term employment; business partnerships, either formal or informal; etc. The Executive Secretary's decision, with right of appeal to the Drinking Water Board, shall be accepted relative to what constitutes a conflict of interest or a relationship sufficient to disqualify an applicant from all or specific witness opportunities.

(IV) An acknowledgement that he/she would not be acting as an agent or employee of the State of Utah and any losses incurred while acting as a witness would not be covered by governmental immunity or Utah's insurance.

(VI) Willingness to follow established protocols and attend such training events as may be required by the Executive Secretary.

(VII) Complete with a minimum 75% passing grade, an examination on water well drilling rules, as offered by the Division of Water Rights.

(C) The Executive Secretary may rescind the authorization if an individual fails to comply with the criteria or conditions of authorization listed above.

(iii) Well Seal Certification

The individual witnessing the well sealing procedure shall provide a signed letter to the Executive Secretary within 30 days of the well sealing including the following:

(A) Certification that the well sealing procedure met all the requirements of Rule R309-515-6(6)(i);

(B) The water right under which the well was drilled and the well driller's license number;

(C) The public water system name (if applicable);

(D) The latitude and longitude of the well and method used for its determination;

(E) The well head's approximate elevation;

(F) Casing diameter(s), length(s), and material(s);

(G) The size of the annulus between the borehole and casing;

(H) A description of the sealing process including the sealing material used, its volume, density, method of placement, and depth from surface; and

(I) The names and company affiliations of other individuals observing the sealing procedure including, but not limited to the well driller, the well owner, and/or a consultant.

(c) After completion of the well drilling the following information shall be submitted and receive a favorable review before water from the well can be introduced into a public water system:

(i) a copy of the "Report of Well Driller" as required by the State Engineer's Office which is complete in all aspects and has been stamped as received by the same;

(ii) a copy of the letter from the authorized individual described in R309-515-6(5)(b) above, indicating inspection and confirmation that the well was grouted in accordance with the well drilling specifications and the requirements of this rule;

(iii) a copy of the pump test including the yield vs. drawdown test as described in R309-515-6(10)(b) along with comments / interpretation by a licensed professional engineer or licensed professional geologist of the graphic drawdown information required by R309-515-6(b)(vi)(E);

(iv) a copy of the chemical analyses required by R309-515-4(5);

(v) documentation indicating that the water system owner has a right to divert water for domestic or municipal purposes from the well source;

(vi) a copy of complete plans and specifications prepared, signed and stamped by a licensed professional engineer covering the well housing, equipment and diversion piping necessary to introduce water from the well into the distribution system; and

(vii) a bacteriological analysis of water obtained from the well after installation of permanent equipment, disinfection and flushing.

(d) An Operation Permit shall be obtained in accordance with R309-500-9 before any water from the well is introduced into a public water system.

(6) Well Materials, Design and Construction.

(a) ANSI/NSF Standards 60 and 61 Certification.

All interior surfaces must consist of products complying with ANSI/NSF Standard 61. This requirement applies to drop pipes, well screens, coatings, adhesives, solders, fluxes, pumps, switches, electrical wire, sensors, and all other equipment or surfaces which may contact the drinking water.

All substances introduced into the well during construction or development shall be certified to comply with ANSI/NSF Standard 60. This requirement applies to drilling fluids (biocides, clay thinners, defoamers, foamers, loss circulation materials, lubricants, oxygen scavengers, viscosifiers, weighting agents) and regenerants. This requirement also applies to well grouting and sealing materials which may come in direct contact with the drinking water.

(b) Permanent Steel Casing Pipe shall:

(i) be new single steel casing pipe meeting AWWA Standard A-100, ASTM or API specifications and having a minimum weight and thickness as given in Table 1 found in R655-4-9.4 of the Utah Administrative Code (Administrative Rules for Water Well Drillers, adopted January 1, 2001, Division of Water Rights);

(ii) have additional thickness and weight if minimum thickness is not considered sufficient to assure reasonable life expectancy of the well;

(iii) be capable of withstanding forces to which it is subjected;

(iv) be equipped with a drive shoe when driven;

(v) have full circumferential welds or threaded coupling joints; and

(vi) project at least 18 inches above the anticipated final ground surface and at least 12 inches above the anticipated pump house floor level. At sites subject to flooding the top of the well casing shall terminate at least three feet above the 100 year flood level or the highest known flood elevation, whichever is higher.

(c) Non-Ferrous Casing Material.

The use of any non-ferrous material for a well casing shall receive prior approval of the Executive Secretary based on the ability of the material to perform its desired function. Thermoplastic water well casing pipe shall meet ANSI/ASTM Standard F480-76 and shall bear the logo NSF-wc indicating compliance with NSF Standard 14 for use as well casing.

(d) Disposal of Cuttings.

Cuttings and waste from well drilling operations shall not be discharged into a waterway, lake or reservoir. The rules of the Utah Division of Water Quality must be observed with respect to these discharges.

(e) Packers.

Packers, if used, shall be of material that will not impart taste, odor, toxic substances or bacterial contamination to the well water. Lead, or partial lead packers are specifically prohibited.

(f) Screens.

The use of well screens is recommended where appropriate and, if used, they shall:

(i) be constructed of material resistant to damage by chemical action of groundwater or cleaning operations;

(ii) have size of openings based on sieve analysis of formations or gravel pack materials;

(iii) have sufficient diameter to provide adequate specific capacity and low aperture entrance velocities;

(iv) be installed so that the operating water level remains above the screen under all pumping conditions; and

(v) be provided with a bottom plate or washdown bottom fitting of the same material as the screen.

(g) Plumbness and Alignment Requirements.

Every well shall be tested for plumbness and vertical alignment in accordance with AWWA Standard A100. Plans and specifications submitted for review shall:

(i) have the test method and allowable tolerances clearly stated in the specifications. and

(ii) clearly indicate any options the design engineer may have if the well fails to meet the requirements. Generally wells may be accepted if the misalignment does not interfere with the installation or operation of the pump or uniform placement of grout.

(h) Casing Perforations.

The placement of perforations in the well casing shall:

(i) be so located to permit as far as practical the uniform collection of water around the circumference of the well casing, and

(ii) be of dimensions and size to restrain the water bearing soils from entrance into the well.

(i) Grouting Techniques and Requirements.

For all public drinking water wells the annulus between the outermost well casing and the borehole wall shall be grouted to a depth of at least 100 feet below the ground surface unless an "exception" is issued by the Executive Secretary (see R309-500-4(1)). If more than one casing is used, including a conductor casing, the annulus between the outermost casing and the next inner casing shall be sealed with grout (meeting the grouting materials requirements of R309-515-6(i)(ii) herein) or with a water tight steel ring having a thickness equal to that of the permanent well casing and continuously welded to both casings.

If a well is to be considered in a protected aquifer the grout seal shall extend from the ground surface down to at least 100 feet below the surface, and through the protective layer, as described in R309-600-6(1)(x) (see also R309-515-6(6)(i)(iii)(D) below).

The following applies to all drinking water wells:

(i) Consideration During Well Construction.

(A) Sufficient annular opening shall be provided to permit a minimum of two inches of grout between the outermost permanent casing and the drilled hole, taking into consideration any joint couplings.

(B) Additional information is available from the Division for recommended construction methods for grout placement.

(C) The casing(s) must be provided with sufficient guides welded to the casing to permit unobstructed flow and uniform thickness of grout.

(ii) Grouting Materials.

(A) Neat Cement Grout.

Cement, conforming to ASTM Standard C150, and water, with no more than six gallons of water per sack of cement, shall be used for two inch openings. Additives may be used to increase fluidity subject to approval by the Executive Secretary.

(B) Concrete Grout.

Equal parts of cement conforming to ASTM Standard C150, and sand, with not more than six gallons of water per sack of cement may be used for openings larger than two inches.

(C) Clay Seal.

Where an annular opening greater than six inches is available a seal of swelling bentonite meeting the requirements of R655-4-9.4.2 may be used when approved by the Executive Secretary.

(iii) Application.

(A) When the annular opening is less than four inches, grout shall be installed under pressure, by means of a positive displacement grout pump, from the bottom of the annular opening to be filled.

(B) When the annular opening is four or more inches and 100 feet or less in depth, and concrete grout is used, it may be placed by gravity through a grout pipe installed to the bottom of the annular opening in one continuous operation until the annular opening is filled.

(C) All temporary construction casings shall be removed prior to or during the well sealing operation. Any exceptions shall be approved by the State Engineer and evidence of approval submitted to the Executive Secretary (see R655-4-9.4.3.1 for conditions surrounding leaving temporary surface casing in place. A temporary construction casing is a casing not intended to be part of the permanent well.

(D) When a "well in a protected aquifer" classification is desired, the grout seal shall extend from the ground surface down to at least 100 feet below the surface, and through the protective clay layer (see R309-600-6(1)(x)).

(E) After cement grouting is applied, work on the well shall be discontinued until the cement or concrete grout has properly set; usually a period of 72 hours.

(j) Water Entered Into Well During Construction.

Any water entering a well during construction shall not be contaminated and should be obtained from a chlorinated municipal system. Where this is not possible the water must be dosed to give a 100 mg/l free chlorine residual. Refer also to the administrative rules of the Division of Water Rights in this regard.

(k) Gravel Pack Wells.

The following shall apply to gravel packed wells:

(i) the gravel pack material is to be of well rounded particles, 95 percent siliceous material, that are smooth and uniform, free of foreign material, properly sized, washed and then disinfected immediately prior to or during placement,

(ii) the gravel pack is placed in one uniform continuous operation,

(iii) refill pipes, when used, are Schedule 40 steel pipe incorporated within the pump foundation and terminated with screwed or welded caps at least 12 inches above the pump house floor or concrete apron,

(iv) refill pipes located in the grouted annular opening be surrounded by a minimum of 1.5 inches of grout,

(v) protection provided to prevent leakage of grout into the gravel pack or screen, and

(vi) any casings not withdrawn entirely meet requirements of R309-515-6(6)(b) or R309-515-6(6)(c).

(7) Well Development.

(a) Every well shall be developed to remove the native silts and clays, drilling mud or finer fraction of the gravel pack.

(b) Development should continue until the maximum specific capacity is obtained from the completed well.

(c) Where chemical conditioning is required, the specifications shall include provisions for the method, equipment, chemicals, testing for residual chemicals, and disposal of waste and inhibitors.

(d) Where blasting procedures may be used the specifications shall include the provisions for blasting and cleaning. Special attention shall be given to assure that the grouting and casing are not damaged by the blasting.

(8) Capping Requirements.

(a) A welded metal plate or a threaded cap is the preferred method for capping a completed well until permanent equipment is installed.

(b) At all times during the progress of work the contractor shall provide protection to prevent tampering with the well or entrance of foreign materials.

(9) Well Abandonment.

(a) Test wells and groundwater sources which are to be permanently abandoned shall be sealed by such methods as necessary to restore the controlling geological conditions which existed prior to construction or as directed by the Utah Division of Water Rights.

(b) Wells to be abandoned shall be sealed to prevent undesirable exchange of water from one aquifer to another. Preference shall be given to using a neat cement grout. Where fill materials are used, which are other than cement grout or concrete, they shall be disinfected and free of foreign materials. When an abandoned will is filled with cement- grout or concrete, these materials shall be applied to the well- hole through a pipe, tremie, or bailer.

(10) Well Assessment.

(a) Step Drawdown Test.

Preliminary to the constant-rate test required below, it is recommended that a step-drawdown test (uniform increases in pumping rates over uniform time intervals with single drawdown measurements taken at the end of the intervals) be conducted to determine the maximum pumping rate for the desired intake setting.

(b) Constant-Rate Test.

A "constant-rate" yield and drawdown test shall:

(i) be performed on every production well after construction or subsequent treatment and prior to placement of the permanent pump,

(ii) have the test methods clearly indicated in the specifications,

(iii) have a test pump with sufficient capacity that when pumped against the maximum anticipated drawdown, it will be capable of pumping in excess of the desired design discharge rate,

(iv) provide for continuous pumping for at least 24 hours or until stabilized drawdown has continued for at least six hours when test pumped at a "constant-rate" equal to the desired design discharge rate,

(v) provide the following data:

(A) capacity vs. head characteristics for the test pump (manufacturer's pump curve),

(B) static water level (in feet to the nearest tenth, as measured from an identified datum; usually the top of casing),

(C) depth of test pump intake,

(D) time and date of starting and ending test(s),

(vi) For the "constant-rate" test provide the following at time intervals sufficient for at least ten essentially uniform intervals for each log cycle of the graphic evaluation required below:

(A) record the time since starting test (in minutes),

(B) record the actual pumping rate,

(C) record the pumping water level (in feet to the nearest tenth, as measured from the same datum used for the static water level),

(D) record the drawdown (pumping water level minus static water level in feet to the nearest tenth),

(E) provide graphic evaluation on semi-logarithmic graph paper by plotting the drawdown measurements on the arithmetic scale at locations corresponding to time since starting test on the logarithmic scale, and

(vii) Immediately after termination of the constant-rate test, and for a period of time until there are no changes in depth to water level measurements for at least six hours, record the following at time intervals similar to those used during the constant-rate pump test:

(A) time since stopping pump test (in minutes),

(B) depth to water level (in feet to the nearest tenth, as measured from the same datum used for the pumping water level).

(11) Well Disinfection.

Every new, modified, or reconditioned well including pumping equipment shall be disinfected before being placed into service for drinking water use. These shall be disinfected according to AWWA Standard C654 published by the American Water Works Association as modified to incorporate the following as a minimum standard:

(i) the well shall be disinfected with a chlorine solution of sufficient volume and strength and so applied that a concentration of at least 50 parts per million is obtained in all parts of the well and comes in contact with equipment installed in the well. This solution shall remain in the well for a period of at least eight hours, and

(ii) a satisfactory bacteriologic water sample analysis shall be obtained prior to the use of water from the well in a public water system.

(12) Well Equipping.

(a) Naturally Flowing Wells.

Naturally flowing wells shall:

(i) have the discharge controlled by valves,

(ii) be provided with permanent casing and sealed by grout,

(iii) if erosion of the confining bed adjacent to the well appears likely, special protective construction may be required by the Division.

(b) Line Shaft Pumps.

Wells equipped with line shaft pumps shall:

(i) have the casing firmly connected to the pump structure or have the casing inserted into the recess extending at least 0.5 inches into the pump base,

(ii) have the pump foundation and base designed to prevent fluids from coming into contact with joints between the pump base and the casing,

(iii) be designed such that the intake of the well pump is at least ten feet below the maximum anticipated drawdown elevation,

(iv) avoid the use of oil lubrication for pumps with intake screens set at depths less than 400 feet (see R309-105-10(7) and/or R309-515-8(2)for additional requirements of lubricants).

(c) Submersible Pumps.

Where a submersible pump is used:

(i) The top of the casing shall be effectively sealed against the entrance of water under all conditions of vibration or movement of conductors or cables.

(ii) The electrical cable shall be firmly attached to the riser pipe at 20 foot intervals or less.

(iv) The intake of the well pump must be at least ten feet below the maximum anticipated drawdown elevation.

(d) Pitless Well Units and Adapters.

If the excavation surrounding the well casing allowing installation of the pitless unit compromises the surface seal the competency of the surface seal shall be restored. Torch cut holes in the well casing shall be to neat lines closely following the outline of the pitless adapter and completely filled with a competent weld with burrs and fins removed prior to the installation of the pitless unit and adapter.

Pitless well units and adapters shall:

(i) not be used unless the specific application has been approved by the Executive Secretary,

(ii) be used to make a connection to a water well casing that is made below the ground. A below the ground connection shall not be submerged in water during installation,

(iii) terminate at least 18 inches above final ground elevation or three feet above the highest known flood elevation whichever is greater,

(iv) pitless adapters or pitless units to be used shall contain a label or imprint indicating compliance with the Water Systems Council Pitless Adapter Standard (PAS-97),

(v) have suitable access to the interior of the casing in order to disinfect the well,

(vi) have a suitable sanitary seal or cover at the upper terminal of the casing that will prevent the entrance of any fluids or contamination, especially at the connection point of the electrical cables,

(vii) have suitable access so that measurements of static and pumped water levels in the well can be obtained,

(viii) allow at least one check valve within the well casing,

(ix) be furnished with a cover that is lockable or otherwise protected against vandalism or sabotage,

(x) be shop-fabricated from the point of connection with the well casing to the unit cap or cover,

(xi) be of watertight construction throughout,

(xii) be constructed of materials at least equivalent to and having wall thickness compatible to the casing,

(xiii) have field connection to the lateral discharge from the pitless unit of threaded, flanged or mechanical joint connection,

(xiv) be threaded or welded to the well casing. If the connection to the casing is by field weld, the shop assembled unit must be designed specifically for field welding to the casing. The only field welding permitted on the pitless unit will be that needed to connect a pitless unit to the casing, and

(xv) have an inside diameter as great as that of the well casing, up to and including casing diameters of 12 inches, to facilitate work and repair on the well, pump, or well screen.

(e) Well Discharge Piping.

The discharge piping shall:

(i) be designed so that the friction loss will be low,

(ii) have control valves and appurtenances located above the pump house floor when an above-ground discharge is provided,

(iii) be protected against the entrance of contamination,

(iv) be equipped with (in order of placement from the well head) a smooth nosed sampling tap, a check valve, a pressure gauge, a means of measuring flow and a shutoff valve,

(v) where a well pumps directly into a distribution system, be equipped with an air release vacuum relief valve located upstream from the check valve, with exhaust/relief piping terminating in a down-turned position at least six inches above the floor and covered with a No. 14 mesh corrosion resistant screen. An exception to this requirement will be allowed provided specific proposed well head valve and piping design includes provisions for pumping to waste all trapped air before water is introduced into the distribution system,

(vi) have all exposed piping valves and appurtenances protected against physical damage and freezing,

(vii) be properly anchored to prevent movement, and

(f) Water Level Measurement.

(i) Provisions shall be made to permit periodic measurement of water levels in the completed well.

(ii) Where permanent water level measuring equipment is installed it shall be made using corrosion resistant materials attached firmly to the drop pipe or pump column and installed in such a manner as to prevent entrance of foreign materials.

(g) Observation Wells.

Observation wells shall be:

(i) constructed in accordance with the requirements for permanent wells if they are to remain in service after completion of a water supply well, and

(ii) protected at the upper terminal to preclude entrance of foreign materials.

(h) Electrical Protection.

Sufficient electrical controls shall be placed on all pump motors to eliminate electrical problems due to phase shifts, surges, lightning, etc.

(13) Well House Construction.

The use of a well house is strongly recommended, particularly in installations utilizing above ground motors.

In addition to applicable provisions of R309-540, well pump houses shall conform to the following:

(a) Casing Projection Above Floor.

The permanent casing for all ground water wells shall project at least 12 inches above the pump house floor or concrete apron surface and at least 18 inches above the final ground surface. However, casings terminated in underground vaults may be permitted if the vault is provided with a drain to daylight sized to handle in excess of the well flow and surface runoff is directed away from the vault access.

(b) Floor Drain.

Where a well house is constructed the floor surface shall be at least six inches above the final ground elevation and shall be sloped to provide drainage. A "drain-to-daylight" shall be provided unless highly impractical.

(c) Earth Berm.

Sites subject to flooding shall be provided with an earth berm terminating at an elevation at least two feet above the highest known flood elevation or other suitable protection as determined by the Executive Secretary.

(d) Well Casing Termination at Flood Sites.

The top of the well casing at sites subject to flooding shall terminate at least 3 feet above the 100 year flood level or the highest known flood elevation, whichever is higher (refer to R309-515-6(6)(b)(vi)).

(e) Miscellaneous.

The well house shall be ventilated, heated and lighted in such a manner as to assure adequate protection of the equipment (refer to R309-540-5(2) (a) through (h).

(f) Fencing.

Where necessary to protect the quality of the well water the Executive Secretary may require that certain wells be fenced in a manner similar to fencing required around spring areas.

(g) Access.

An access shall be provided either through the well house roof or sidewalls in the event the pump must be pulled for replacement or servicing the well.

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